# Weekly Report for 03/23/2015

## Highlights

• Completed final edits (second review) and Y. Ivanyushenkov resubmitted SCU0 paper. Paper was accepted for publication in PRSTAB and is expected to appear in the April 2015 edition. (Kathy Harkay)

• Gave a talk entitled "Abort kicker multiparticle tracking, Part 2" at the AOP weekly physics meeting (Mar 26) on the latest abort kicker results, focusing on using the septum chamber as the main loss location. (Kathy Harkay)

• Participated in PAR ion studies with CY. Yao and J. Calvey, giving further evidence of ion trapping and providing data for model benchmarking. (Kathy Harkay)

## APS Renewal and Upgrade

• Discussed several impedance related issues with R. Lindberg and M. Sangroula, including radiation damping and microwave instability. (Joe Calvey)

• Continuing to work on analytical model of the transverse monopole wake. Putting together a presentation on this for this Friday's upgrade meeting. (Joe Calvey)

• Calculated expected tune shift due to ions in the PAR, using realistic gas pressure (from RGA readings provided by J. Dooling). Confirmed with Lanfa's simulation. (Joe Calvey)

• See PAR machine studies. (Kathy Harkay)

• Attended APS-U Vacuum meeting. (Kathy Harkay)

• Made a new wall file for Cornell synrad3d modeling of the multiplet chamber with rectangular wings, and tested it, and shared it with J. Carter. Started to develope a wall file with more realistic rounded wings, as designed by B. Stillwell. More work is needed. (Kathy Harkay)

• MOGA optimization on alternate lattice with reverse bends, emittance 67pm. (Yipeng Sun)

• Evaluations of MOGA solutions. (Yipeng Sun)

• Continued on Touschek beam loss simulation. (Aimin Xiao)

• Fixed a small bug on injection simulation setup. Resubmit jobs. (Aimin Xiao)

• Discussed Lambertson magnet structure with M. Jaski. (Aimin Xiao)

• Ran some simulations of the microwave instability with and without the HHC for APSU. Found that my HHC parameters were not properly optimized, so that some previous single bunch current limit simulations underestimated the beneficial aspects of the HHC. Made myself more work! (Ryan Lindberg)

# MCR Operations

## Storage Ring Operations

• Reviewed the SCU1 Commissioning Readiness checklist with J. Grimmer and added him under management. (Kathy Harkay)

• Assisted the MCR with turning beam over to Users. (Karen Schroeder)

• Investigated beam losses. (Karen Schroeder)

### MCR Operations administrative/misc.

• Compiled the downtime report and either gave to Flood for presentation or presented it myself at OPS Directorate. (Karen Schroeder)

• Completed the ID gap threshold for X-ray BPMs web page and gave to Flood for posting. (Karen Schroeder)

• Reviewed machine studies schedule and provided feedback. Sent operators e-mail describing what was expected during the studies to return optics to User operation. (Karen Schroeder)

• Reviewed updated procedures for inclusion of operator required reading. (Karen Schroeder)

## APS Machine Studies

### Storage Ring Studies

• With J. Dooling, acquired FPGA waveforms for various values of IK1 kicking a single bunch to compare trajectory and loss locations (sum signal) with elegant modeling and with BLM data. Thanks to N. Sereno, L. Emery, G. Decker for discussions. (Kathy Harkay)

• Repeated FPGA waveform studies for elegant model verification. Tracked several cases in advance to: a) limit x trajectory to less than 10 mm (3 kV); b) IK2 at 10 kV to confirm ID6 exclusive beam losses; and c) IK4 as an alternate for ID1 exclusive beam losses (BLM calibration). Used IK1 at 3 kV to kick a single bunch; only x data were acquired. Found good fit with 0.33 mrad kick. Also fit data from the prior week. Presented results and fits at the weekly AOP machine studies meeting. (Kathy Harkay)

• Participated in ID1 beam loss study with K. Harkay. Attempted to setup single-turn FPGA histories. (Jeff Dooling)

• Performed gap scans to update the feedforward tables for ID Gap Feedforward. Returned those x-ray bpms which had been removed during steering. (Karen Schroeder)

• Calibrated two of the power supplies switched during studies and installed new calibration table. Discussed process with Fors. Made temporary limited SCR save until the DCPS cals could be incorporated into the UBOP. (Karen Schroeder)

• ID4 physical aperture with BPM setpoint. (Yipeng Sun)

• Half integer resonance study on RHB lattice. (Yipeng Sun)

• Tune scan on RHB injection efficiency. (Yipeng Sun)

• Performed simulation on half/integer resonance crossing using calibrated APS model. Tested the idea with beam and succeeded. Results confirm that particles can cross half integer resonance without losing beam. (Aimin Xiao)

• Measured coupling resonance line width under different skew quad setting. Results look very good. Further data processing against with simulation results is needed. (Aimin Xiao)

### PAR Studies

• Measured tune along PAR cycle to check for ion accumulation (with C.Y. Yao, K. Harkay, and M. Sangroula). Consistent with ion effects, the tune increases along the cycle, eventually reaching saturation. The actual tune shift is overestimated by analytical calculations and simulation. We suspect the measured pressure may not accurately reflect the actual pressure near the beam; we are meeting with the vacuum group later this week to discuss using simulation to get a better estimate.

(Joe Calvey)

• Participated in PAR ion studies with CY Yao and J. Calvey. We acquired the vertical tune over the cycle as a function of charge, with RF12 on and off. I made suggestions of cases to measure, and we discussed the results. I also made a number of plot commands for J. Calvey as he prepared a talk for the weekly machine studies meeting. (Kathy Harkay)

### Linac Studies

• Succeeded in aligning the green alignment laser onto the photocathode. PC Gun should now be ready to generate photoelectrons. (Jeff Dooling)

• Conducted RG1 study with S. Pasky. (Jeff Dooling)

## APS Machine Research and Development

### Storage Ring Research and Development

• Continued abort kicker simulations. Carried out high-resolution tracking for selected bunches -- 200k macroparticles -- and found the loss distributions to be essentially identical to 2k. (Kathy Harkay)

• Gave a talk entitled "Abort kicker multiparticle tracking, Part 2" at the AOP weekly physics meeting (Mar 26) on the latest abort kicker results, focusing on using the septum chamber as the main loss location. Analyzed and compared the ideal and calibrated lattice model, and using the calibrated model compared four design waveforms provided by J. Wang. (Kathy Harkay)

• Analyzed the loss distributions using elegant for a measured abort kicker waveforms provided by J. Wang, using 5 kV and 10 kV HV setpoint. For the latter, also analyzed 90% and 80% of the peak. (Kathy Harkay)

• Tracked several cases in elegant of single bunch kicked by one of the injection kickers, in an attempt to understand recent machine studies to calibrate ID1 BLM, using a 2-mm bump. At the weekly machine studies meeting, A. Zholents encouraged us to use a large bump. Compared with and without an inboard 2-mm, 4-mm, and 8-mm bump in ID1, and realized that a 2-mm bump is not sufficient. Simulated other tracking cases to test in machine studies (no bump) (see SR studies). (Kathy Harkay)

• Reviewed the SCU1 Fact Finding Committee report, relating to the failed vacuum chamber bimetallic flange. (Kathy Harkay)

• MARS modeling shows with 75 percent of the beam lost in the septum, maximum temperature excursions are less than 30K in all components. (Jeff Dooling)

• A maximum dose of 9 kGy is indicated in the kapton film insulator between the beam chamber and the conductor. According to DuPont Corp. kapton maintains essentially full dielectric strength at dosages up to 10 MGy. (Jeff Dooling)

### Booster Research and Development

• Completed impedance model for booster and began learning how to implement the model in elegant. (Ryan Lindberg)

### Linac Research and Development

• Completed calculation of focal length and beam waist in the regen cavity. (Jeff Dooling)

• Found waist locations agree with those measured by S. Edstrom (SLAC). He too found the laser

rods actually contribute positive focusing. (Jeff Dooling)

• Set up for measurement of the Nd:Glass absorption line near 805 nm. (Jeff Dooling)

## Publications, papers and report

• Started working on a paper for the ICFA BD newsletter with J. Dooling. (Kathy Harkay)

• Tuesday received a request to write an ICFA-BDN article on beam loss with K. Harkay. Request is for the April Newsletter so have asked for additional time to complete the task. (Jeff Dooling)

• Fractional tune scan on Hybrid lattice, AOP-TN-2015-014. Yipeng Sun (April 2, 2015) (Yipeng Sun)

• Two dimensional automatic scan tool for knobs, AOP-TN-2015-013. Yipeng Sun, Hairong Shang (March 26, 2015) (Yipeng Sun)

## Meetings, workshops, conferences, committees, LMS related, and reviews

• Attended shutdown planning meetings. (Karen Schroeder)

• Attended meeting to discuss beam stability with Users. Provided information to Emery and Sereno as to web pages and what was currently available. Noticed some of the medm user steering screens were not up-to-date and arranged to have Mazzio work with Hahne to do update them. (Karen Schroeder)

• Attended machine studies meetings. (Karen Schroeder)

• Attended all-hands meeting. (Karen Schroeder)

• Reviewed paper for PRST-AB on FEL oscillators (Ryan Lindberg)

## LCLS

• Ran and discussed a few simulations for an x-ray FEL oscillator driven by the superconducting LCLS-II; due to the low (4 GeV) energy the oscillator operates at a harmonic of the fundamental. It looks possible with planned LCLS-II parameters. (Ryan Lindberg)

## Safety and Required Training

• Successfully completed Counterintelligence, Classification, Export Control and Security Refresher Course (Karen Schroeder)

## Miscellaneous

• Submitted a FY15Q2 quarterly report of effort highlights. Compiled a list of my publications for ASD to correct a draft list. (Kathy Harkay)

• T. Lutes (AES-IT) took Dell D630 Latitude laptop CSI335252 to be sanitized and removed from my sensitive items inventory. (Jeff Dooling)

• Wellness Exam at Medical. (Jeff Dooling)

• 4-hrs of AL on Friday. (Jeff Dooling)

• Made machine study schedule for next week. (Aimin Xiao)

• Took 1 day sick leave and 1 day vacation leave. (Aimin Xiao)

- Prepared IPAC 15 trip. (Aimin Xiao)